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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/749,910

12/30/2003

Kulwinder Dhanoa

15114H-071400US

1395

20350

7590

05/21/2008

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EXAMINER

LEE, CHUN KUAN

ART UNIT

PAPER NUMBER

2181

MAIL DATE

DELIVERY MODE

05/21/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/749,910	Applicant(s) DHANOA, KULWINDER	
	Examiner Chun-Kuan Lee	Art Unit 2181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-8,11-14 and 16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-8,11-14 and 16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 May 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

RESPONSE TO ARGUMENTS

1. Applicant's arguments with respect to claims 1-2, 5-8 and 11-13 have been considered but are moot in view of the new ground(s) of rejection. Currently claims 3-4, 9-10 and 14-17 are canceled and claims 1-2, 5-8 and 11-13 are pending for examination.

I. REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 7-8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. (US Patent 6,816,923) in view of Iizuka et al. (US Patent 5,581,530) and Nguyen et al. (US Patent 5,335,326).

3. As per claims 1, 7 and 13, Gray teaches a memory controller system, method and programmable logical device, comprising:

at least one bus interface (devices interface 250 of Fig. 2-3), each bus interface being for connection to at least one respective device (device 221-224 of Fig. 3) for receiving memory access requests (col. 8, ll. 52-63);

a memory interface (Fig. 2-3, ref. 200, 270), for connection to a (external) memory device (Fig. 1, ref. 25 and Fig. 2-3, ref. 210) over a memory bus (Fig. 2-3), wherein the memory interface utilize a list structure to provide the scheduling of data storing in response to the memory access request (Fig. 5-6 and col. 9, ll.13-22);

a plurality of buffers (Fig. 3, ref. 202-209) in the memory interface (Fig. 3, ref. 200, 270);

a memory access request (Fig. 6, ref. 307, 308);

control logic (DMA engine 200 of Fig. 2), for placing received memory access requests into a queue of memory access requests (col. 10, l. 65 to col. 11, l. 24), wherein the queue of memory access requests comprising the critical request queue and the non-critical request queue for receiving the respective memory access request, and

wherein, in response to a received memory access request (Fig. 6, ref. 307, 308) requiring multiple data bursts (Fig. 6, ref. 301-306) (e.g. a request having burst of data transferring for each channel) over the memory bus, each of said multiple data bursts is assigned by the control logic (DMA engine 200 of Fig. 2) to a respective buffer (Fig. 3, ref. 202-209) of the plurality of buffers in the memory interface, and data from each of said multiple data bursts is stored by the memory interface in the respective buffer (col. 2, ll. 47-56; col. 8, ll. 10-22 and col. 11, l. 59 to col. 12, l. 6), wherein data for the first

device (Fig. 3, ref. 221) may be stored in the first device buffer (Fig. 3, ref. 204), data for the second device (Fig. 3, ref. 222) is stored in the second device buffer (Fig. 3, ref. 206) and so on; and as the memory interface's DMA engine regulate the transferring of data by being responsible for providing data to each device, for monitoring the remaining data in the corresponding device buffers, and for provide arbitration functionality to the devices as well as the memory, it would have been obvious for the DMA engine to implementing the assignments; and

transferring of data in response to the memory access request (col. 7, ll. 6-42).

Gray does not expressly teach the memory controller system, method and programmable logical device, comprising: each of the plurality of buffers sized to store a data burst ...; wherein, for a wrapping memory access request requiring multiple buffers ..., and wherein the control logic records a value of a pointer

Iizuka teaches a buffer system and method comprising:

a plurality of buffers (Fig. 8, ref. 9-1 to 9-3), wherein each of the plurality of buffers sized to store a data burst for a request, each of the plurality of buffers further include a plurality of sub-buffers each sized to store a data beat of the data burst stored in the corresponding buffer (Fig. 8; Fig. 14(a) to 14(e); col. 11, ll. 5-26; col. 14, ll. 49-57 and col. 26, ll. 4-39), wherein each FIFO buffer includes the corresponding plurality of sub-buffers for storing the data beat;

a wrapping memory access request (e.g. request of DMA transfer associated with Fig. 14(e)) requiring multiple buffers, data required for each of a beginning and an

end of the wrapping memory access request are assigned to respective sub-buffers of a single respective buffer (e.g. single cyclical FIFO ring buffer 9-1 to 9-3 of Fig. 8), the beginning and end data for the memory access request being stored concurrently from a single data burst in the respective sub-buffers of the single respective buffer, the storing of the beginning and end data in a single buffer (e.g. single cyclical FIFO ring buffer 9-1 to 9-3 of Fig. 8) avoiding the need for an additional data burst to obtain the end data, the data required for the end of the wrapping memory access being cached in the respective sub-buffer until needed for transferring (Fig. 8; Fig. 14(a) to 14(e); col. 11, ll. 5-26; col. 14, ll. 49-57 and col. 26, ll. 4-39), and

wherein a first sub-buffer of the single buffer (e.g. single cyclical FIFO ring buffer 9-1 to 9-3 of Fig. 8) storing the end data, such that enabling the returning to the indicated sub-buffer to retrieve the end data from the single respective buffer (e.g. single cyclical FIFO ring buffer 9-1 to 9-3 of Fig. 8) (Fig. 8; Fig. 14(a) to 14(e); col. 11, ll. 5-26; col. 14, ll. 49-57 and col. 26, ll. 4-39).

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include lizuka's buffering architecture into Gray's device buffers for the benefit of implementing a simplified structure and providing an optimal priority order for data transferring (lizuka, col. 2, ll. 61-67) to obtain the invention as specified in claims 1, 7 and 13.

Nguyen teaches a FIFO buffer flow regulation system and method comprising wherein the control logic (Fig. 1, ref. 34) records a value of a pointer (recording the

pointer value in a channel sequence registers 74-1 and 74-2 of Fig. 2) (col. 5, ll. 60 to col. 6, ll. 22), wherein the channel sequence registers comprising the input pointer (Fig. 2, ref. 86-1, 86-2) and the output pointer (Fig. 2, ref. 88-1, 88-2) for pointing to the proper slot for the next input operation and the next output operation respectively.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Nguyen's utilization of the plurality of pointers by the central control into Gray and Iizuka's control logic for the benefit of proper tracking and control regarding the accessing of the circular buffer (Nguyen, col. 5, ll. 60-66) to obtain the invention as specified in claims 1, 7 and 13.

4. As per claims 2 and 8, Gray, Iizuka and Nguyen teach all the limitations of claims 1 and 7 as discussed above, where Gray further teaches the memory controller system, method and programmable logical device, comprising wherein, when returning data to the respective device from which a memory access request requiring multiple data bursts over the memory bus was received, data is read out from a first part of the single buffer, then data is read out from at least one other of said buffers, then data is read out from a second part of the single buffer (Gray, col. 12, ll. 18-30), wherein the particular device of the plurality of devices (Gray, Fig. 3, ref. 221-224) can make request for data every other cycle, therefore data associated with the first device (Gray, Fig. 3, ref. 221) is read from the associated device buffer (Gray, device buffer 204 of Fig. 3), then data of the second device (Gray, Fig. 3, ref. 222) is read from the associated device buffer

(Gray, device buffer 206 of Fig. 3), then returns to the reading the associated device buffer (Gray, device buffer 204 of Fig. 3) of the first device (Gray, Fig. 3, ref. 221).

5. Claims 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. (US Patent 6,816,923) in view of Iizuka et al. (US Patent 5,581,530) and Nguyen et al. (US Patent 5,335,326) as applied to claims 1 and 7 above, and further in view of Kuronuma et al. (US Patent 6,859,848).

Gray, Iizuka and Nguyen teach all the limitations of claims 1 and 7 as discussed above, where Gray further teaches the memory controller system, method and programmable logical device, comprising allocating a respective portion of the one of said buffers (Gray, Fig. 3, ref. 204-209) for each of the memory burst (Gray, col. 8, ll. 10-22).

Gray, Iizuka and Nguyen does not expressly teach the memory controller system, method and programmable logical device, comprising wherein the control logic determines whether a received read access request is a wrapping request which requires multiple memory bursts.

Kuronuma teaches the controlling system and method for sequential access to a SDRAM comprising a detector detecting the number of possible sequential access to the SDRAM associated to a received DMA request (col. 4, ll. 27-44), wherein the detection would determine the number of multiple memory burst required by the received DMA request.

It would have been obvious to one of ordinary skill in this art, at the time when invention was made to include Kuronuma's detection of the number of possible sequential access of the SDRAM into Gray, lizuka and Nguyen's control logic for the benefit of providing a relative simple configuration for accessing the memory for multiple sequential memory bursts (Kuronuma, col. 4, ll. 15-20) to obtain the invention as specified in claims 5 and 11.

6. Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. (US Patent 6,816,923) in view of lizuka et al. (US Patent 5,581,530) and Nguyen et al. (US Patent 5,335,326) as applied to claims 1 and 7 above, and further in view of "Microsoft Computer Dictionary".

Gray, lizuka and Nguyen teach all the limitations of claims 1 and 7 as discussed above.

Gray, lizuka and Nguyen does not expressly teach the memory controller system, method and programmable logical device, comprising wherein the memory controller is a SDRAM controller, and said memory interface is suitable for connection to a SDRAM memory device over said memory bus.

"Microsoft Computer Dictionary" teaches the utilization of the SDRAM, wherein it is well known by one skilled in the art that SDRAM is a common type of RAM utilized within the computer system (Page 469), wherein the memory controller associated with the SCRAM would obviously be a SDRAM controller.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Microsoft Computer Dictionary's SDRAM into Gray, Iizuka and Nguyen's memory (Gray, Fig. 3, ref. 210) for the benefit of that SDRAM can run at a higher clock speed ("Microsoft Computer Dictionary", Page 469) to obtain the invention as specified in claims 6 and 12.

II. CLOSING COMMENTS

Conclusion

a. STATUS OF CLAIMS IN THE APPLICATION

The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. 707.07(i)**:

a(1) CLAIMS REJECTED IN THE APPLICATION

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**, and claims 1-2, 5-8 and 11-13 have received a final action on the merits. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

b. DIRECTION OF FUTURE CORRESPONDENCES

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chun-Kuan (Mike) Lee whose telephone number is (571) 272-0671. The examiner can normally be reached on 8AM to 5PM.

IMPORTANT NOTE

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alford Kindred can be reached on (571) 272-4037. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C.K.L./

May 12, 2008

Chun-Kuan (Mike) Lee
Examiner
Art Unit 2181

/Alford W. Kindred/

Supervisory Patent Examiner, Art Unit 2163